3. MEASURING EARNINGS LOSSES AND REPLACEMENT RATES

The goal of this analysis is to measure the adequacy and equity of workers' compensation benefits for workers with permanent disability claims. In order to measure adequacy, the benefits received must be compared to some estimate of losses from a permanently disabling workplace injury. These losses can be thought of as consisting of two parts: the lost earnings while out of work and receiving temporary disability benefits, and the additional losses associated with the permanent residual impairment that qualifies the worker for permanent disability benefits. Our focus in the measurement of permanent losses is motivated by a stated purpose of the permanent disability benefit in workers' compensation in California: compensation for the "diminished ability of such injured employee to compete in an open labor market" (Labor Code, §4660). We assume that this diminished ability may result in lower earnings both through increased time out of work after the injury and through lower wages. We therefore estimate the total lost earnings after injury and compare the lost earnings to the benefits received.

To illustrate our approach to estimating losses, Figure 4 presents hypothetical losses from a permanently disabling workplace injury. The dashed line represents potential uninjured earnings or the earnings the worker would have received if the injury had not occurred. This line increases with time representing returns to experience or to tenure at the employer. The solid line represents the observed earnings of the worker. At the time of injury, the worker receives no earnings for some time while recovering from the injury. This is the period during which temporary disability benefits are received.

At some point, the worker returns to work, perhaps in some modified capacity. In the example in Figure 4, the worker returns at a wage that is lower than what she received prior to injury. We then observe her wages increasing over time and converging toward the wages she would have received had she not been injured. However, in this example, we do not observe full wage recovery, and at the end of the period, the worker makes more than she made prior to injury, but not as much as she would have made if she had not been injured. The shaded area represents the total lost earnings over the period after the injury. Estimating this area and determining what fraction is replaced by workers' compensation benefits is the goal of this analysis.

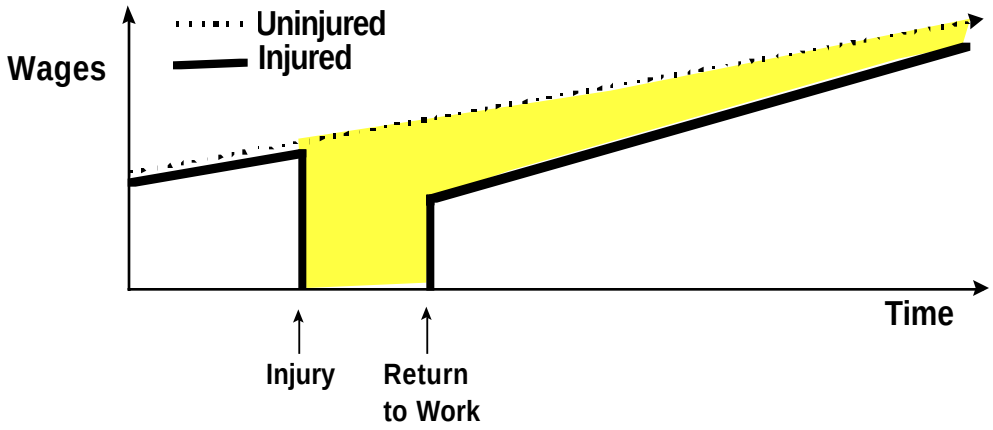

Figure 4—The Hypothetical Effect on Earnings of a Workplace Injury

While the solid line in Figure 4, earnings while injured, is readily observable, the challenge for estimating earning losses is the dashed line, uninjured earnings. At an administrative level, workers' compensation programs must also estimate uninjured earnings when setting benefits, and typically use the pre-injury earnings. However, particularly for estimating the long-term consequences of permanent disabilities, the pre-injury wage is not a satisfactory proxy. First, without the injury, the worker may have experienced wage growth over time, which the pre-injury earnings will not measure. Earnings growth is illustrated in Figure 4 by the fact that while the injured worker soon exceeds pre-injury earnings, her earnings still fall below what she would have made had the injury never occurred. Second, if the injury had not occurred, it is possible that the injured worker would have been unemployed or exited the workforce for different reasons. It is not appropriate to assume that they would have earned the pre-injury earnings in every post-injury earnings period.

Instead of using pre-injury earnings, we estimate uninjured earnings in the post-injury period using the earnings of a comparison or control group. This approach draws its inspiration from training program evaluation literature (Dehejia and Wahba, 1996; Heckman and Hotz, 1989; Holland, 1986; Lalonde, 1986). The control group consists of workers who were similar to the injured workers with respect to demographic and economic characteristics, but who did not experience a workplace injury during the time period under examination.

For the comparison group for workers injured at self-insured employers, we selected 25 workers at the same firm with earnings that were closest to the injured worker's over the year prior to injury. From among the 25, we selected the closest five with the same tenure as the

injured worker.[1] The estimates from insured employers use the same comparison group described in Peterson et al (1998): up to 10 workers at the same firm with similar earnings in the year prior to injury but without matching on tenure.[2] We evaluated match quality by examining the difference between the earnings of comparison and injured workers during the 2-5 years prior to injury, as will be illustrated below. We were not able to attain the match quality of the insured firm matches with the self-insured firms when we used the same approach we used for the insured. We therefore added the additional tenure match for the self-insured, and were able to obtain comparable match quality for both samples.[3]

In each quarter after injury, we calculated the difference between the injured worker's earnings and the average of the earnings of the worker's comparison group. This is the estimate of earnings loss in that quarter. For five-year earnings losses for that individual, we summed the earnings losses in the quarter of injury and 20 quarters after. Formally, let y_t^I represent the injured worker's earnings (where I denotes "injured" and the subscript t denotes time from the injury). Let the comparison worker's earnings be represented by y_t^U where U denotes "uninjured." We estimated y_t^U using the average earnings of the *n* comparison workers for that individual injured worker.[4] For any individual, the undiscounted earnings loss between the time of injury, which we denoted t = 0, and some future date, T, is

$$\text{earnings loss} = \sum_{t=0}^{T} (y_t^U - y_t^I) \qquad (1)$$

To produce a single earnings loss estimate for the sample, we averaged the quantity in equation (1) across all injured workers.

In many cases we were interested in estimating proportional earnings losses, or what fraction of potential uninjured earnings over some time period that an injured worker loses. Normalizing by what the individual would have made facilitates comparison over time when average earnings may be growing. It also allows comparison across firms that may pay different amounts, such as comparing the self-insured and the insured. Proportional earnings losses are estimated as earnings losses divided by the total earnings received by the comparison group, or

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[1] We defined tenure as three categories: less than one year, one to two years, and more than two years.

[2] See also the data appendix in Reville (1999).

[3] We also found that adding the tenure match for the insured reduced sample size without improving match quality. See footnote 11, Chapter 5.

[4] For the self-insured, n=1 to 5. See Appendix A. For the insured, n=1 to 10. See Peterson et al (1997) or Reville (1999).

$$\text{proportional earnings loss} = \frac{\sum_{t=0}^{T}(y_t^U - y_t^I)}{\sum_{t=0}^{T} y_t^U} \qquad (2)$$

We also estimated replacement rates of lost earnings, or the fraction of losses replaced by workers' compensation benefits. The benefits included in this calculation are temporary disability, permanent partial disability, and vocational rehabilitation maintenance allowance.[5] We used incurred benefit amounts and included the full amount of compromise and release settlements in the calculation of benefits[6]. Since we only observed the full amount of benefits paid or incurred on a claim, but estimated losses based upon a particular time period that may be shorter than the time period over which benefits are paid, we adjusted benefits to reflect the same time period during which the losses were calculated. See the appendix for further details on the estimates of benefits paid. Let b_t denote the benefits paid to an individual in period t, then the replacement rate is defined as:

$$\text{replacement rate} = \frac{\sum_{t=0}^{T} b_t}{\sum_{t=0}^{T}(y_t^U - y_t^I)} \qquad (3)$$

Since workers' compensation benefits are untaxed and earnings are taxed, we also report a simulated after-tax estimate of the replacement rate. This estimate is based upon an estimate of family earnings given individual earnings calculated using the Census Bureau's Current Population Survey. Taxes are calculated using estimates of average tax rates including federal income taxes and social insurance (Medicare and Social Security) drawn from a report by the Congressional Budget Office (CBO, 1998), and California income taxes drawn from a report by the Citizens for Tax Justice (CTJ, 1996). See Appendix A for more details on the calculation of after-tax replacement rates.

As in Peterson *et al* (1998), Berkowitz and Burton (1987), and CWCI (1984), we use two-thirds wage replacement as the standard for adequacy of workers' compensation benefits. This choice is based upon an extension of the statutory goal for temporary disability benefits and for permanent total disability benefits, where the legislative intent is most apparent. We note, however, that it is possible that policymakers intended for workers with higher pre-injury

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[5] Salary continuance, which is taxable, is typically reported to EDD as wages and therefore is included in the estimates as reduced wage loss.

earnings to have a lower wage replacement rate, given the existence of caps for both temporary disability and permanent total disability.

The replacement rate, defined in (3), provides a measure of adequacy, but for questions of equity that compare the adequacy of benefits for injuries of different severity, it may obscure considerable differences in *uncompensated wage losses*, or total losses after benefits. Formally, we define

$$\text{uncompensated wage loss} = \sum_{t=0}^{T}\left(y_t^{\,u} - (y_t^{I} + b_t)\right) \qquad (4)$$

For example, suppose one worker with a minor injury experiences losses of $90 and receives $30 in compensation, while another worker loses $90,000 and receives $60,000 in compensation. The first worker has a one-third replacement rate while the second has a two-thirds replacement rate. However, the first worker has uncompensated losses of $60 while the second has $30,000. We do not know a standard to apply to evaluate uncompensated earnings losses, but we believe that policymakers will benefit from knowing both when considering a policy response to our findings.

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6 We also only include benefits received in the first PPD claim. While multiple claims for TTD are relatively common (see, for instance, Gotz and Liu, 1999), multiple PPD claims are less common (approximately 7 percent of the individuals in our data had more than one PPD claim in different quarters).